California Department of Transportation
Engineering Service Center
Division of Materials Engineering and Testing Services
5900 Folsom Blvd.
Sacramento, CA 95819-4612

May 2002

APPROVED ADMIXTURES FOR USE IN CONCRETE

The list of Approved Admixtures for Use in Concrete is published periodically for reference primarily by Caltrans field personnel and others involved in Caltrans projects.

As per State of California, Department of Transportation, Standard Specifications (July 1995), Section 90-4.03, no admixture brand will be used in the work unless it is on Caltrans current list of approved brands for the type of admixture involved. Admixture brands will be considered for addition to the approved list if the manufacturer of the admixture submits to the Transportation Laboratory, 5900 Folsom Blvd., Sacramento, CA 95819, a sample of the admixture accompanied by certified test results which verify that the admixture complies with the requirements in the appropriate ASTM designation. The sample shall be sufficient to permit performance of all required tests. Approval of admixture brands will be dependent upon a determination as to compliance with the specifications, based on the certified test results submitted, together with any tests Caltrans may elect to perform.

The Approved List includes only those admixtures that comply with the following ASTM designations:

The list provides certain essential data for field reference as well as general information that may assist in assessing properties of the plastic concrete.

The information contained herein may not be used for advertising purposes nor is it to be considered as an endorsement by Caltrans.

From ACI 212.1R, "Admixtures for Concrete"

5.2 - COMPOSITION

The materials that are generally available for use as water-reducing admixtures and set-controlling admixtures fall into five general classes:

1. Lignosulfonic acids and their salts
2 Modifications and derivatives of lignosulfonic acids and their salts
3. Hydroxylated carboxylic acids and their salts
4. Modifications and derivatives of hydroxylated carboxylic acids and their salts
5. Other materials, which include:

(i) inorganic materials, such as zinc salts, borates, phosphates, chlorides,
(ii) amines and their derivatives,
(iii) carbohydrates, polysaccharides, and sugar acids,
(iv) certain polymeric compounds, such as cellulose ethers, melamine derivatives, naphthalene derivatives, silicones, and sulfonated hydrocarbons.

These admixtures can be used either alone or in combination with other organic or inorganic, active or essentially inert substances.

NOTES:

* Chemical admixtures containing chlorides as Cl^- in excess of one percent by weight of admixture shall not be used in prestressed or reinforced concrete.

** When the Contractor is permitted to reduce cement content by adding chemical admixtures, the dosage of admixture shall be the dosage used in ASTM Designation: C494 for qualifying the admixtures.

† This admixture contains more than 1% chlorides as determined by California Test 415 and shall not be used in prestressed or reinforced concrete.

AE = Air Entrained
NAE = Non-Air Entrained

Type A - Water-reducing admixtures
Type B - Retarding admixtures
Type C - Accelerating admixtures
Type D - Water-reducing and retarding admixtures
Type E - Water-reducing and accelerating admixtures
Type F - Water-reducing, high range admixtures
Type G - Water-reducing, high range and retarding admixtures

					At the Qualifying ASTM Dosage(s), What Changes are Expected Relative to the Reference Concrete?			Dosage Rate Suggested by Manufacturer	
Product or Brand Name	ASTM Type	Class or Composition	Chloride Content* %	Dosage Rates Used to Qualify for Appropriate ASTM Tests**, fl. oz. per 100 lbs. cement (report date)	Water Reduction, %	Change in AEA Dose Needed to Maintain Air Content	Initial Set Retardation, (Acceleration) hours	fl. oz. per 100 lbs. of cement	See Pg 2
W. R. Grace and Company 7237 East Gage Ave. Los Angeles, CA 90040									
ADVA Cast-1	F	Carboxylated Polyether	<1	6.3 (1997)	AE 15.3	More	AE 1.4	3.0 to 12.0	
ADVA Flow	F	Carboxylated Polyether	<1	6.0 (1995)	AE 12.8	More	AE 1.1	3.0 to 12.0	
ADVA 100	F	Carboxylated Polyether	<1	5.2 (1999)	15.5	More	AE 0.0	3.0 to 10.0	
Daraccel	E	Calcium Chloride, Triethanolamine	>20	16.0 (1983)	AE 5.7	Less	AE (1.4)	8.0 to 40.0	†
Daracem 50	A	Lignin, Calcium Chloride, and Polymers	>8	5.0 (1992)	AE 7.6	Less	Negligible	5.0 to 7.0	†
Daracem 55	A	Lignin, Calcium/Sodium Nitrate, Polymer	<1	4.0 (1992)	AE 5.8	Less	AE 0.9	3.0 to 9.0	
Daracem 100	A, F	Naphthalene Sulfonate	<1	8 (1991)	AE 11.5	Less	AE 0.3	9.0 to 11.0	
Daracem 100	G	Naphthalene Sulfonate	<1	12 (1991)	AE 15.0	Less	AE 3.3	12.0 to 15.0	
Daracem ML 330	F	Melamine-Formaldehyde Polymer	<1	14.5 (1998)	AE 15.4	More	AE 1.2	6.0 to 25.0	
Daracem ML 500	A, F	Melamine and Naphthalene Sulfonate Formaldehyde Co-Polymers	<1	12.0 (1999)	AE 12.0	More	AE 0.4	6.0 to 25.0	
Daracem 19 (Formerly WRDA 19)	A, F	Naphthalene-Sulfonate Formaldehyde Copolymer	<1	8.0 to 25.0 (1981)	AE 20 to 30	Less	AE 0.5 to 1.0	8.0 to 25.0	
Daracem 65	A	Lignosulfonates, Melamine Polymer and Amine	<1	5.8 (1998)	AE 6.7	Less	AE 0.7	3.0 to 9.0	
Daraset	C	Calcium Nitrate Solution	<1	45.0 (1994)	AE 4	Same	AE (1.0)	20.0 to 50.0	
Daraset 200	C	Calcium Nitrate/Nitrite Based Solution	<1	30 (1998)	AE 8.3	More	AE (2.6)	10-100	
Daratard 17	B, D	Hydroxylated Organic Compounds	<1	3.0 (1992)	AE 8	More	AE 2.0	2.0 to 7.0	
Darex	C Corrosion Inhibitor	Calcium Nitrite Aqueous Solution	<1	78.0 (1979)	Negligible	Same	AE (2.0)	50.0 to 170.0	

					At the Qualifying ASTM Dosage(s), What Changes are Expected Relative to the Reference Concrete?			Dosage Rate Suggested by Manufacturer	
Product or Brand Name	ASTM Type	Class or Composition	Chloride Content* %	Dosage Rates Used to Qualify for Appropriate ASTM Tests**, fl. oz. per 100 lbs. cement (report date)	Water Reduction, %	Change in AEA Dose Needed to Maintain Air Content	Initial Set Retardation, (Acceleration) hours	fl. oz. per 100 lbs. of cement	See Pg 2
Mira 70	A, F	Carboxylated Polyether	<1	12.0 (1999)	AE 12.0	More	AE 0.7	2.5 to 15.0	
Polarset	C	Calcium Nitrate/ Nitrite Solution	<1	30.0 (1994)	AE 5	Same	AE (3.0)	8.0 to 100.0	
WRDA 20	A	Glucose Polymers, Lignosulfonate, and Amine	<1	2.5 (1985)	AE 6.8	Less	AE 1.0	2.5	
WRDA 64	A	Lignosulfonate, Amine, and Glucose Polymer	<1	3.0 (1979)	AE 11	Less	AE 1.4	3.0 to 5.0	
WRDA 79	A, D	Modified Lignosulfonate	<1	5.0 to 7.5 (1980)	AE 8 to 10	Less	AE 1.0 to 2.2	4.0 to 10.0	
WRDA 82	A	Lignosulfonate and Amine	<1	3.0 (1983)	AE 6.1	Less	AE 0.2	3.0	
WRDA w/Hycol	A	Organic Compounds w/Hydration Control Agent	<1	3.0 and 5.0 (1974)	AE 5 to 7	Less	AE (0.3) to 1.3	3.0 to 5.0	
Recover	D	Hydroxycarboxylic Acid Salts	<1	5.0 (1992)	AE 9.0	Same	AE 1.7	2.0 to 16.0	

Hill Brothers Chemical Co.
1675 N. Main Street
Orange, CA 92667

HICO 610	A	Sodium Lignosulfonate	<1	5.0 (1987)	NAE 5.7	Not Tested for Air Entrained Concrete	NAE (1)	5.0 to 12	
HICO 911	C	Polymer Modified Calcium Chloride	>33	24 (1992)	NAE 2.7	Not Tested for Air Entrained Concrete	NAE (2.0)	32 to 64	†

Master Builders
23700 Chagrin Blvd.
Cleveland, OH 44122

Pozzolith 400-N	A, F	Naphthalene Sulfonate	<1	15.0 (1991)	AE 28	More	AE 0.2	10.0 to 20.0	
Delvo Stabilizer	B, D	Salts of Organic Agent	<1	4.0 (1992)	AE 7.8	Less	AE 1.1	2.0 to 130	
Master Pave N	A	Glucose Polymer	<1	2.0 (1989)	AE 6.0	Less	AE 0.4	2.0 to 4.0	
MBL-82	A	Lignin	<1	5.0 (1991)	AE 7	Less	AE 0.3	5.0 to 10.0	
MBL-82	B, D	Lignin	<1	8.0 (1990)	AE 9.5	Less	AE 1.6	5.0 to 10.0	

					At the Qualifying ASTM Dosage(s), What Changes are Expected Relative to the Reference Concrete?			Dosage Rate Suggested by Manufacturer	
Product or Brand Name	ASTM Type	Class or Composition	Chloride Content* %	Dosage Rates Used to Qualify for Appropriate ASTM Tests**, fl. oz. per 100 lbs. cement (report date)	Water Reduction, %	Change in AEA Dose Needed to Maintain Air Content	Initial Set Retardation, (Acceleration) hours	fl. oz. per 100 lbs. of cement	See Pg 2
Polyheed	A	Lignosulfonate, Triethanolamine, Ammonium Thiocyanate	<1	7.0 (1991)	AE 6.1	Same	AE 0.4	3.0 to 12.0	
Polyheed RI	B, D	Cement Dispersing Agent	<1	4.0 (1994)	AE 7.6	Less	AE 1.25	3.0 to 12.0	
Polyheed FC 100	A, C, E,	Cement Dispersing Agent	<1	9.0, 15.0 (1998)	AE 6.7	More	AE (0.7)	8.0 to 30.0	
Pozzolith NC 534	C	Cement Dispersing Agent	<1	27.0 (1993)	AE 5.7	More	AE (1.7)	10.0 to 100[X]	
Polyheed 997	A	Lignosulfonate Triethanolamine	<1	5.0 (1990)	AE 6.9	Less	AE 0.4	3.0 to 12.0	
Polyheed 997	F	Lignosulfonate Triethanolamine	<1	8.0 (1990)	AE 12.3	Less	AE 0.3	3.0 to 12.0	
Pozzolith 100-XR	B, D	Glucose Polymer	<1	2.5 (1993)	AE 6.1	Same	AE 1.5	2.0 to 4.0	
Pozzolith 122 HE	C, E	Cement Dispersing Agent	>24	17.0 (1998)	AE 5.5	More	AE (1.1)	16.0 to 64.0	
Pozzolith 200 N	A, B, D	Cement Dispersing Agent	<1	4.0 (1998)	AE 6.9	Less	AE 0.7	3.0 to 5.0	
Pozzolith 220 N	B, D	Polymer, Triethanolamine	<1	3.5 (1991)	AE 5.8	Less	AE 1.8	2.0 to 5.0	
Pozzolith 220-N	A	Polymer, Triethanolamine	<1	2.0 (1991)	AE 6.2	Less	AE 0.5	2.0 to 5.0	
Pozzolith 300 N	A	Polymer, Triethanolamine	<1	3.0 (1990)	AE 7-8	Less	AE 0.3	3.0 to 5.0	
Pozzolith 300-R	B, D	Polymer	<1	5.0 (1990)	AE 10	Less	AE 2.6	3.0 to 5.0	
Pozzolith 322-N	A	Polymer, Triethanolamine	<1	4.0 (1990)	AE 8.0	Less	AE 0.7	3.0 to 7.0	
Pozzolith 344-N	A	Calcium Chloride, Triethanolamine	>8	6.0 (1991)	AE 6.5	Less	AE 0.6	3.0 to 9.0	†
Pozzolith 80	A, B, D	Cement Dispersing Agent	<1	3.0 (1998)	AE 6.8	Same	AE 0.2	4.0 to 10.0	
Pozzutec 20	C, E	Polymer	<1	15.0 (1990)	AE 5.5	More	AE 1.1	5.0 to 90.0	
Rheobuild 1000	A, F	Naphthalene Sulfonate	<1	15.0 (1988)	AE 18	Less	AE 0.4	5.0 to 25.0	
Rheobuild 2000 B	A, F	Cement Dispersing Agent	<1	10.0 (1994)	AE 13.9	More	AE 1.1	10.0 to 25.0	
Glenium 3000 NS	A, F	Based on gleniumTechnology	<1	4.0 (1998)	AE 12.4	Less	AE 0.2	4.0 to 6.0	

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Product or Brand Name	ASTM Type	Class or Composition	Chloride Content* %	Dosage Rates Used to Qualify for Appropriate ASTM Tests**, fl. oz. per 100 lbs. cement (report date)	Water Reduction, %	Change in AEA Dose Needed to Maintain Air Content	Initial Set Retardation, (Acceleration) hours	fl. oz. per 100 lbs. of cement	See Pg 2
Glenium 3030 NS	A,F	Based on Polycarboxylate Technology	<1	6.0 (2001)	AE 36.6	Less	AE (0.1)	6.0 to 18.0	
Glenium 3200 HES	A, F	Based on Polycarboxylate Technology	<1	3.5 (2001)	AE 26.4	Less	AE (0.1)	2.0 to 14.0	
RMC 121	A	Lignosulfonate Triethanolamine	<1	5.0 (1990)	AE 6.9	Less	AE 0.4	3.0 to 12.0	
RMC 121	F	Lignosulfonate Triethanolamine	<1	8.0 (1990)	AE 12.3	Less	AE 0.3	3.0 to 12.0	
Rheocrete CNI	C & Corrosion Inhibitor	Calcium Nitrite Based	<1	1.0 (2001)	AE 4.8	More	AE (1.5)	18.5 to 110	

[X] Dosage recommended for ultra-high early strength concrete that achieve a flexural strength of 2.8 Mpa in four or more hours.

Sika Chemical Corporation
1372 East 15th Street
Los Angeles, CA 90021

Plastocrete 161	A	Lignosulfate	<1	4 (1982)	AE 7.7	Same	AE 0.2	3.0 to 5.0	
Plastocrete 161 FL	C	Inorganic Salt-Organic Mixture	<1	16 (1987)	AE 5.4	Same	AE 1.25	12.0 to 24.0	
Plastocrete 161 HE	C	Calcium Chloride Triethylamine	>5	34 (1978)	AE 1.3	Less	AE (1.0)	6.0 to 64.0	†
Plastocrete 161 MR	B, D	Lignosulfonates	<1	2.9 (1989)	AE 7.4	Same	AE 2.4	3.0 to 6.0	
Plastocrete 169	A	Lignosulfonates	<1	4 (1985)	AE 8.73	Same	AE (0.25)	3.0 to 7.0	
Plastocrete 169	B, D	Lignosulfonates	<1	6 (1986)	AE 22	Same	AE 2.3	3.0 to 7.0	
Plastiment	B, D	Hydroxylated Carboxylic Acid	<1	4.0 (1990)	AE 7.3	Same	AE 3.1	2.0 to 4.0	
Sikament FF	F	Melamine Polymer	<1	12 (1994)	AE 12.2	Same	AE 1.3	10.6 to 21.2	
Sikament 86	F	Melamine Polymer	<1	12 (1994)	AE 14.4	Same	AE 0.7	10.6 to 21.2	
Sikament 300	F	Blend Sodium Alkylnapthalene	<1	12 (1992)	AE 12.2	Same	AE 1.0	6.0 to 24.0	
Plastiment NS	A	Lignosulfonates	<1	4 (1996)	AE 7.6	Less	AE 1.1	2.0 to 4.0	

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Product or Brand Name	ASTM Type	Class or Composition	Chloride Content* %	Dosage Rates Used to Qualify for Appropriate ASTM Tests**, fl. oz. per 100 lbs. cement (report date)	Water Reduction, %	Change in AEA Dose Needed to Maintain Air Content	Initial Set Retardation, (Acceleration) hours	fl. oz. per 100 lbs. of cement	See Pg 2
Sika-Rapid- 1	C	RMF-1503	<1	20 (1996)	AE 3.1	Less	AE (1.6)	4.0 to 48.0	

Boral Material Technologies, Inc.
45 N. E. Loop 410, Suite 700
San Antonio, TX 78216

Boral RDI	F,G,	Sulfonated Naphthalene Formaldehyde	<1	4.0 (1990)	AE 15.3	Same	AE (1.0)	6.0 to 20.0	
Boral LR	A,D	Lignosulfonate	<1	6.0 (1997)	AE 8.0	Less	AE (1.1)	4.0 to 6.0	
Boral NR	A,D	Lignosulfonate Based Material	<1	3.0 (1997)	AE 6.7	Less	AE (1.2)	3.0 to 6.0	
Boral NW	A,D	Lignosulfonate Based Material	<1	3.0 (1997)	AE 7.5	Less	AE (0.2)	3.0 to 6.0	
Boral X15	A	Lignosulfonate Based Material	<1	4.0 (1993)	AE 5.4	Less	AE (0.1)	3.0 to 10.0	
Boral ACN	C, E	Blend of Admixture	<1	60.0 (1998)	AE 8.6	More	AE (1.6)	20.0 to 50.0	
Boral ACN 200	C, E	Calcium Nitrate	<1	50.0 (1999)	AE 6.5	More	AE (3.4)	10.0 to 60.0	
Boral DS	B	Phosphates Salts	<1	4.0 (1998)	AE 3.0	Less	AE 1.2	-	
Boral SP	A, F	Sulfonated Napthalene Formaldehyde Condensate	<1	7.0 (1998)	AE 17.1	More	AE (0.2)	6.0 to 25.0	
Boral HC	A, B, D	Carbohydrate Salts	<1	2.5, 5 (1998)	AE 6.5 AE 7.3	Same Same	AE 0.6 AE 2.0	2-6	
Boral TR	B, D	Carbohydrate Salts	<1	4.0 (1998)	AE 6.8	Less	AE 3.1	3-6	
Boral LW	A	Lignin Family	<1	3.0 (1997)	AE 9.5	Less	AE 0.3	3-10	
Boral HW	A	Lignin Family	<1	6.0 (1998)	AE 6.9	Less	AE 1.0	3-10	
Boral SPC	A, F	Polycarboxylated Polymer and other additives	<1	5 (2001)	AE 13.2	Same	AE (0.1)	3.0 – 6.0	
Boral SPJ	A, F	Polycarboxylate Polymer	<1	7 (2001)	AE 12.9	Same	AE 0.8	4.0 – 7.0	
Boral X20	A, F	Lignin Family	<1	13 (2002)	AE 12.3	Less	AE 1.1	3.0 – 15.0	

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Product or Brand Name	ASTM Type	Class or Composition	Chloride Content* %	Dosage Rates Used to Qualify for Appropriate ASTM Tests**, fl. oz. per 100 lbs. cement (report date)	Water Reduction, %	Change in AEA Dose Needed to Maintain Air Content	Initial Set Retardation, (Acceleration) hours	fl. oz. per 100 lbs. of cement	See Pg 2
The Euclid Chemical Company 19218 Redwood Road Cleveland, Ohio 44110-2799 Tel. No: (216) 531-9222									
Accelguard HE	E	Calcium Chloride based Material	31-35	24 (1997)	AE 6.3	More	(1.5)	16-32	
Eucon 37	A, F	Napthlene Sulfonate	<1	16 (1999)	AE 18.31	Same	AE 0.7	10-16	
Eucon Retarder 100	D	Sodium Gluconate	<1	3 (1999)	AE 6.4	Less	AE 1.9	2-6	
Eucon MR	A	Calcium Nitrate & Calcium Ligno Sulfonate Material	<1	6 (1999)	AE 7.1	Same	AE 1.1	4-10	
Eucon WR	A	Calcium-Sodium Ligno Sulfate	<1	5 (1997)	AE 8.3	Less	AE 0.5	4-5	
Eucon WR-91	A	Calcium Ligno Sulfonate	<1	3 (1999)	AE 6.4	Less	AE 0.6	2-6	
Fritz-Pak Corporation 11220 Grader Street, Suite 600 Dallas, TX 75238									
Delayed Set	B, D	Modified Lignosulfonate	<1	3.0 (2001)	AE 7.5	Less	AE 1.2	1.0 to 1.7	
FR-1	D	Formaldehyde	<1	2.5 (2001)	AE 7.5	Less	AE 1.1	1.5 to 2.0	
Supercizer #1	F	Formaldehyde	<1	7.0 (2001)	AE 12.5	Less	AE 0.4	5.0 to 7.0	
Supersizer #5	F	Formaldehyde	<1	6.0 (2001)	AE 14.6	Less	AE 0.2	5.0 to 7.0	
Supercizer #7		Formaldehyde	<1	6.0 (2001)	AE 15.5	Less	AE 1.4	4.0 to 12.0	

Product or Branch Name	Class or Composition	Chloride Content (percent)	Report Date	Dosage Rate Suggested by Manufacturer
MBVR Standard	Vinsol Resin	<1	1991	0.4 to 4.0
MB-VR Concentrated	Vinsol Resin	<1	1992	0.4 to 4.0
MBAE-90 also called Pave Air 90	Rosin Soap	<1	1993	0.25 to 4.0
Micro-Air	Fatty acid Salts	<1	1991	1.0
Pave-Air	Vinsol Resin	<1	1992	1.0

W. R. Grace and Company
7237 East Gage Ave.
Los Angeles, CA 90040

Amex 210	Benzene Sulfonate Sodium Salt	<1	1989	0.5 to 8.0
Darex AEA	Organic Acid Salts	<1	1975	0.8
Darex II AEA	Alkaline Solution of Fatty Acid Salts	<1	1993	0.75 to 3.0
Daravair 1000	Neutralized Resin and Rosin	<1	1994	0.75 to 3.0
Daravair	Neutralized Resin and Rosin	<1	1994	0.75 to 3.0
Daravair M	Neutralized Vinsol Resin	<1	1975	1.0
Daravair AT 60	Aqueous Solution of Neutralized Vinsol Resin, Amine and Fatty Acids	<1	1994	0.5 to 3.0

Sika Chemical Corporation
1372 East 15th Street
Los Angeles, CA 90021

Sika AER	Neutralized Vinsol Resin	<1	1986	0.5 to 1.5
Sika AEA 15	Sodium Salt Type Soap	<1	1983	0.5 to 1.5
Sika AEA 14	Sodium Salt of an Organic Ester	<1	1996	0.5 to 3.0

Product or Branch Name	Class or Composition	Chloride Content (percent)	Report Date	Dosage Rate Suggested by Manufacturer
Hill Brothers Chemical Company 1675 North Main St. Orange, CA 92667-3442				
HICO-315-L	Sodium Tall Oil Fatty Acid Soap	<1	1968	0.75 to 3.0
Boral Material Technologies, Inc. 45 N. E. Loop 410, Suite 700 San Antonio, TX 78216				
Boral Air 40	Resin Surfactant	<1	1997	1.0
The Euclid Chemical Company 19218 Redwood Road Cleveland, Ohio 44110-2799				
AEA – 92	Synthetic Organic Chemicals based Admixture	<1	1992	½ to 1.0
Fritz-Pak Corporation 11220 Grader Street, Suite 600 Dallas, TX 75238				
Air Plus		<1	2001	0.25 to 1.25
Super Air Plus		<1	2001	0.25 to 1.25

Product	Type or Composition (Solid or Solution)	Calcium Chloride Content in Percent (given for solution form only)	Grade (given for solid form only)
Hill Brothers Chemical Company 1675 North Main St. Orange, CA 92667-3442			
HB-98	Solution	30.1	
Lee Chemical, Incorporated 3113 McKinley Way Costa Mesa, CA 92626			
ASTM Grade	Solution		
Cargill Solarchem Resources 7200 Central Avenue Newark, CA 94560-4206			
Liquid Calcium Chloride, Technical Grade, Treated	Solution	38.3	
W. R. Grace and Company 62 Whittemore Avenue Cambridge, Mass. 02140 Tel. No. (617) 498-4555			
Grace Accelerator	Solution	30-45	

Company Name	Classification of Mineral Admixture	% Calcium Oxide (Range)
(1) Boral Materials Technology (formerly Western Ash Company) 7500 N Dreamy Draw, Suite 234 P.O. Box 7360 Phoenix, Arizona 85036		
(a) Mojave Fly Ash (Laughlin, Nevada)	F	8.5 to 9.9
(b) Apache Fly Ash (Cochise, Arizona)	F	3.0 to 8.0
(c) Snowflake (Snowflake, Arizona)	F	3.0 to 4.2
(d) Monticello (Monticello, Texas)	F	7.1 to 8.0
(2) ISG Resources, Inc. 7525 S.E. 24th Street Mercer Island, Washington 98040		
(a) Centralia Fly Ash (Centralia, Washington)	F	7.6 to 8.0
(b) Jim Bridger Fly Ash (Rock Springs, Wyoming)	F	6.2 to 7.5
(c) IPSC/Delta Fly Ash (Delta, Utah)	F	9.1 to 9.9
(d) Hunter Fly Ash (Castle Dale, Utah)	F	7.9 to 9.9
(e) Navajo Flyash	F	6.5 to 8.0
(3) Phoenix Cement Company 8800 E. Chaparral Road, Suite 155 Scottsdale, AZ 85250-2618 Tel. No. (480) 850-5757		
(a) Cholla Fly Ash (Joseph City, Arizona)	F	3.1 to 5.0
(b) Four Corners Fly Ash (Fruitland, New Mexico	F	2.4 to 2.8
(c) Escalante Flyash (Prewit, New Mexico)	F	2.5 to 4.8
(4) Mineral Resources Technologies, LLC 120 Interstate North Parkway East, Suite 440 Atlanta, GA 30339		
(a) Coronado Fly Ash (St. John, Arizona)	F	2.6 to 5.0